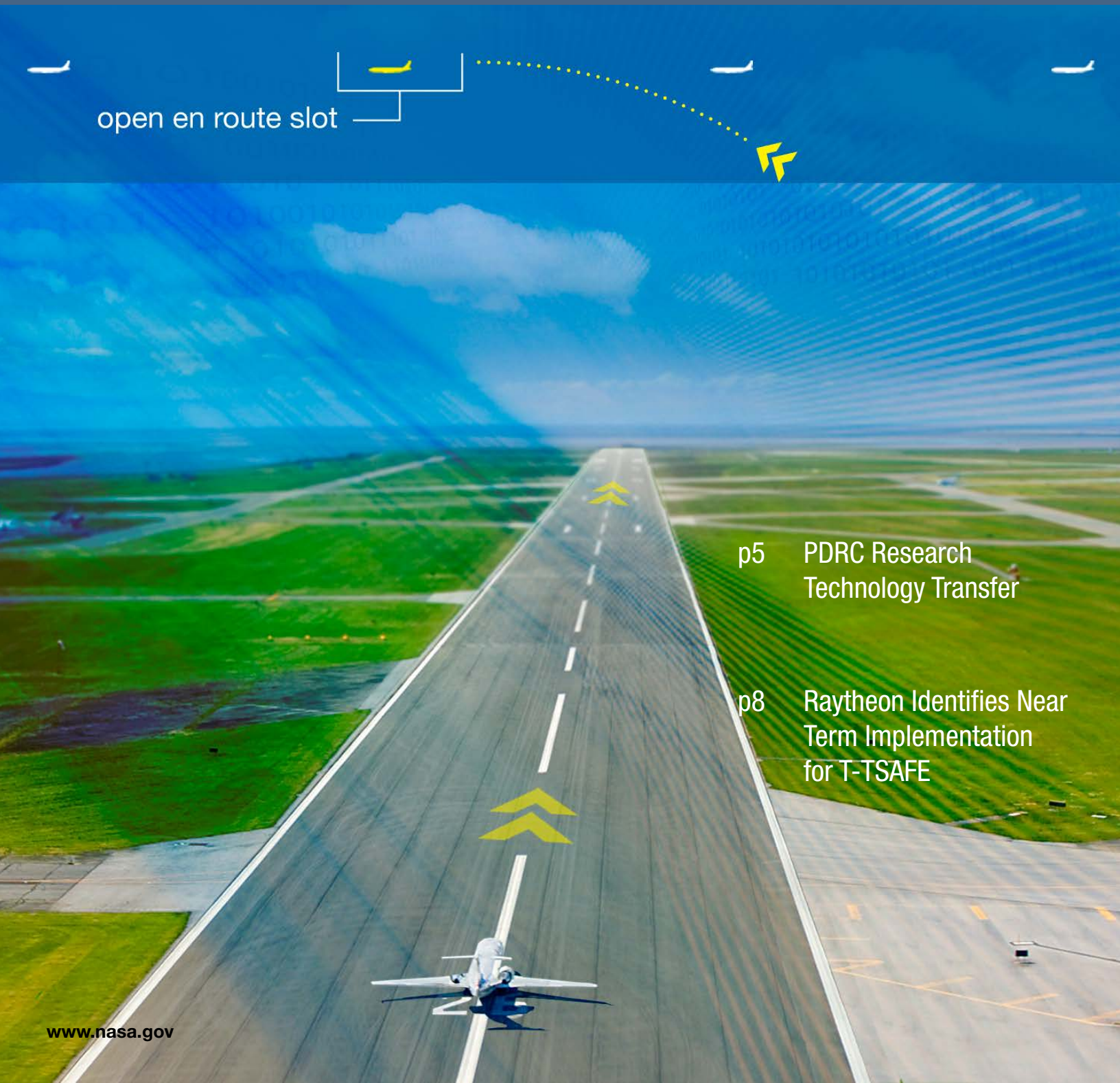
National Aeronautics and Space Administration

Airspace Systems Program Newsletter

JUL–SEP 2013



www.nasa.gov

// Technical/Programmatic Highlights

DWR Release 2.0 Installed at American Airlines Integrated Operations Center, July 2013

The Dynamic Weather Routes (DWR) software release 2.0 was installed on the American Airlines (AA) trial system in Fort Worth, Texas on July 1. The new software selects DWR routes according to the expected time required for flight dispatchers and pilots to evaluate, coordinate and implement reroutes. It also enables users at airline operations centers to interactively examine the impact of maneuver execution delay on flying time savings, weather proximity, traffic conflicts, and other factors. Other new features include automation to prevent routes through narrow gaps in convective weather cells, and identification of flights on weather-avoidance routes previously prescribed by the Federal Aviation Administration's (FAA) Air Traffic Control System Command Center.

Prior to the release, several members of the DWR team visited AA's Fort Worth Integrated Operations Center to review the new software, obtain user feedback, and discuss plans for the DWR trial going forward. About 25 AA users and managers participated in several meetings over three days and all remained very supportive of DWR. Separately, data analysis showed an estimated actual savings of 360 flying minutes for 46 AA flights during the month of May 2013, which included several days of heavy convective weather.

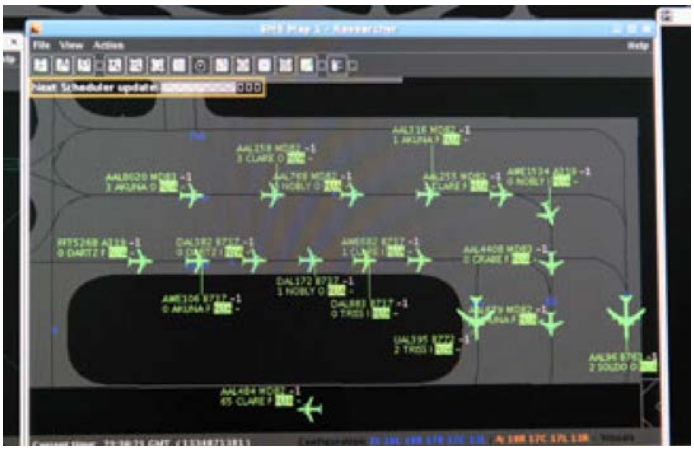
The next steps are to investigate the use of DWR technology for flights nearing their destination airport, including the application of common reroutes for multiple flights and those with time-based metering constraints, investigate generalized methods to adapt DWR for all en route centers, and help facilitate technology transfer. Several companies have expressed interest in DWR commercialization.
(POC: Dave McNally)

DWR tool in operation at the American Airlines System Operations Center, Fort Worth, TX

FAA TFM Deployment Team Meeting, July 2013

The FAA's Traffic Flow Management (TFM) Deployment Team meeting was held during the week of July 15 in Atlantic City, NJ. It was attended by FAA employees, FAA contractors and airline personnel. Dr. Kapil Sheth was invited to the meeting to present recent research on miles-in-trail (MIT) modeling. Particularly, the TFM team was interested in modeling the passback MIT restrictions to upstream facilities, when MIT at a downstream airspace fix is imposed to manage traffic for weather or volume constraints.

The current TFM infrastructure has limited MIT modeling and no MIT passback modeling. Traffic managers now rely upon their own experience to derive passback values, which can result in inefficient operations. An air traffic control system command center specialist provided positive input and offered to provide access to two or three specialists to help modify the model to be operationally viable. The FAA has also begun to specify realistic scenarios for testing MIT passback advisories.
(POC: Dr. Kapil Sheth)



Spot and Runway Departure Advisor (SARDA) tool

Second Workshop on Charlotte Airport Operations, July 2013

NASA researchers and subject matter experts (SMEs) from Charlotte International Airport (CLT) participated in a two-day workshop July 17–18 at Ames Research Center. The SMEs included a retired air traffic control (ATC) tower controller/traffic management coordinator/supervisor, a US Airways captain, and two US Airways ramp controllers. During the workshop, SMEs walked though CLT surface operations from three different perspectives—pilot, ATC control and ramp control—and provided input on the proposed user interface design of the Spot and Runway Departure Advisor (SARDA) tool for CLT ramp controllers. The data gained from the discussions will aid researchers in formulating the scheduler function of SARDA, which will provide ramp controllers with advisories for more efficient push-back operations.
(POC: Dr. Yoon Jung)

CMS ATD-1 Simulation 5.1, July 2013

Phase 1 of a three-phase Controller-Managed Spacing (CMS) Air Traffic Management Technology Demonstration-1 (ATD-1) simulation to compare realistic baseline operations with operations supported by ATD-1 technologies concluded successfully July 18 in the Airspace Operations Laboratory of the Human Systems Integration Division at NASA Ames Research Center. Traffic scenarios were derived from recorded Albuquerque Center (ZAB) traffic that included peak-period arrivals into Phoenix Sky Harbor International Airport (PHX), together with recorded ZAB winds. Former ZAB and Phoenix TRACON (P50) controllers staffed eight center arrival sectors and four P50 arrival sectors.

Metrics from Phase 1 will be compared to metrics collected in subsequent phases, during which participants will control identical traffic scenarios under the same wind conditions using ATD-1 arrival-management

technologies. For Phase 2, scheduled for September, controllers will utilize ATD-1 ground tools. For Phase 3, scheduled for November, controllers will again use ATD-1 ground tools, and will also issue Flight-Deck Interval Management (FIM) clearances to FIM-equipped desktop simulators.
(POC: Todd Callantine)

German Aerospace Center Researcher Visits NASA Ames, July 2013

As part of an air traffic management collaboration Mr. Florian Linke, team leader of air traffic infrastructures and processes at the Hamburg-based German Aerospace Center – the Deutsche Zentrum für Luft- und Raumfahrt, or DLR – Air Transportation Systems, visited NASA Ames Research Center's Aviation Systems Division for four months starting July 8. Mr. Linke studied aircraft performance modeling on North Atlantic air traffic trajectory optimization and climate impact.

Based on climate sensitivity functions for various aircraft emission data provided by DLR, algorithms will be adapted to compute optimal aircraft trajectories for given atmospheric conditions. Different aircraft performance models from NASA and DLR will be used for air traffic and emission distribution simulations. Their results will be compared with respect to the influence of their level of fidelity on climate-impact metrics.

This research supports the "route optimization under all conditions" collaboration topic, and will provide the basis for further research between NASA and DLR on the simulation and optimization of U.S. and European air traffic and its associated environmental impact.
(POC: Dr. Banavar Sridhar)

Final Presentation for SEACAT NRA, July 2013

The final presentation for the System level Environmental Analysis of Concepts and Technologies (SEACAT) NASA Research Announcement (NRA) was held at NASA Ames Research Center on July 30. The NRA with Metron Aviation, with support from LMI and Purdue University, explored the linkage of environmental demand, capacity and delay models, and how air traffic management (ATM) decision processes and aircraft equipage contribute to fuel consumption, emissions of carbon dioxide and nitrogen oxides, noise, and air quality.

The most direct linkage of new operational concepts and technologies to environmental impact is through their effects on air traffic demand and delays in travel time. A limited set of concepts and technologies was studied to determine environmental benefits and associated impact on aircraft operators. A method for system-wide determination of how specific ATM technologies affect the environment was developed. A draft final report is due at the end of August, with the final deliverable by the end of September.
(POC: Harry Swenson)

Non-Reimbursable SPO Studies Agreement Signed, August 2013

Under an agreement between NASA Langley Research Center and Rockwell Collins, joint investigations to benefit aviation concepts were conducted beginning August 31, involving cockpit flight control, planning, and alerting systems. This research supports investigations into Single Pilot Operations (SPO) for transport aircraft. NASA Langley and Rockwell Collins will study the simplification and redesign of flight control systems for aircraft. Investigations will focus on reducing the training and workload burdens on a single pilot while improving situation awareness and maintaining equivalent or better levels of safety.

The joint research will include, but is not limited to, development of concepts of operations, displays and controls that support simplified flight control, and automation concepts that maintain safety and efficiency of current Part 121 operations. This research also includes the evaluation of these concepts. Both Langley and Rockwell Collins will be responsible for the development and conduct of experiments as well as to supply hardware and software in support of these efforts as required.

(POC: Paul Schutte)

PDRC Research Technology Transfer, August 2013

On August 6, NASA formally transferred the Precision Departure Release Capability (PDRC) to the Federal Aviation Administration (FAA) in a ceremony at FAA Headquarters in Washington, DC. PDRC enables surface decision support systems to be connected to the Traffic Management Advisor (TMA) in order to provide more accurate off-time predictions, and improve the efficiency of departures as they merge into en-route streams to internal airports and adjacent centers. The NASA North Texas Research Station led this research and development effort, demonstrating an ability to improve off-time compliance to 83% from the current-day level of 54%. PDRC also has the potential to improve metering schedules for more than 20% of arriving aircraft at today's TMA-metered airports.

(From l. to r.) Pam Whitley, Jaiwon Shin, and David Grizzle hold up the PDRC handoff certificate during the formal transfer ceremony at FAA Headquarters in Washington, D.C . (Image Credit: NASA / Maria Werries)

Leading the NASA contingent was Associate Administrator for Aeronautics Dr. Jaiwon Shin. NASA Ames Research Center was represented at the ceremony by Shawn Engelland, PDRC chief engineer; William Chan, chief of the System Modeling and Simulation Branch; Tom Davis, chief of the Aviation Systems Division; and NASA Ames Deputy Director Lew Braxton. The FAA was represented by Mr. David Grizzle, the FAA's chief operating officer, and Ms. Pam Whitley, the FAA's acting assistant administrator for the Next Generation Air Transportation System.
(POC: Tom Davis)

Integrated IADS RTT Meeting, August 2013

Mr. Gary Lohr, the NASA lead for Tactical Runway Configuration Management (TRCM), participated in an August 7 NASA Langley Research Center meeting of the Integrated Arrival/Departure/Surface (IADS) Research Transition Team (RTT). During the meeting, NASA provided the FAA a status update on progress toward the IADS research and research transition products, as well as a brief on future NASA IADS plans. The NASA IADS research brief included TRCM, which has been developed at NASA Langley, and the Spot And Runway Departure Adviser (SARDA), which has been developed at NASA Ames Research Center. A TRCM algorithm designed to efficiently manage runways at a single airport has been transferred to the FAA as a Research Transition Product (RTP) under this agreement.
(POC: Gary Lohr)

Meeting with JAXA Visitors, August 2013

Visitors from the Japan Aerospace Exploration Agency (JAXA) and members of the Distributed and Revolutionarily Efficient Air-traffic Management System (DREAMS) project met with NASA Airspace Systems Program and Project staff and Aviation Systems Division researchers on August 7-8 at NASA Ames Research Center. The JAXA team described their research in wake vortex prediction and disaster recovery and relief efforts, while the NASA team shared their work in wake vortex research and environmental modeling. The project teams provided information about the overall research and development efforts and technical challenges within the Concepts and Technology Development (CTD) and System Analysis, Integration and Evaluation (SAIE) Projects. Both organizations agreed to continue discussions to investigate specific areas of collaboration.
(POC: Akbar Sultan)

NASA-DLR Workshop on Surface Traffic Management, August 2013

NASA Ames Research Center hosted researchers from the German Aerospace Center – the Deutsche Zentrum für Luft- und Raumfahrt, or DLR – for a three-day workshop August 21-23 on the topic of surface traffic management. NASA and DLR have a formal agreement to collaborate on surface management research, and began collaborative efforts in December 2012. During the workshop, each organization briefed the current status of their respective

surface management research. The teams discussed in detail how to create a common integrated concept of surface management, discussed comparisons of concepts and technologies for surface management between the United States and Europe, and identified commonalities and differences in operational procedures and traffic management concepts.

This research collaboration is designed to assess the integrated arrival/departure/surface (IADS) capabilities and research of each organization, identify the complementary aspects and determine potential value added to each partner and, ultimately, to advance the state of capabilities in the area of aircraft operations/IADS through synergy. The teams agreed to complete a joint draft concept document by the end of October 2013. *(POCs: Yoon Jung & Gary Lohr)*

System Oriented Runway Management Final Briefing, August 2013

A demonstration of algorithmic tools developed by Optimal Synthesis Inc. under a Phase II Small Business Innovation Research (SBIR) effort was held August 20 at the company's Los Altos, Calif. offices. Mr. Gary Lohr, the SBIR's technical manager, attended the final briefing/demonstration. The Phase II effort entitled "Statistical Decision Support Tools for System-Oriented Runway Management" was based on a statistical approach providing information for traffic flow/runway management. A methodology for estimating traffic flow parameters such as flow rate and delay time in the terminal area and on the airport surface was developed as part of this effort.

Additionally, accurate models of airspace were created for the Los Angeles and San Francisco terminal areas: two particularly complex operational environments in the national airspace system. For these environments, the tool permits the selection of airports, runways/configurations, routes, traffic scenarios (based on FAA-provided traffic data), among other options. Outputs of the capabilities developed include delay estimation, dynamic runway assignment, runway configuration and miles-in-trail restrictions for delay absorption. A graphical user interface was also developed to provide information to the users.

This work is being evaluated to determine potential for integration into capabilities developed under NASA's System Oriented Runway Management (SORM) research effort.
(POC: Gary Lohr)

NASA Langley Hosts Technical Interchange Meeting, August 2013

A technical interchange meeting (TIM) between the leaders of NASA's Air Traffic Management Technology Demonstration-1 (ATD-1), NASA's Systems Analysis, Integration and Evaluation (SAIE) Project, and the Federal Aviation Administration's (FAA) Surveillance and Broadcast Systems (SBS) Interval Management (IM) was held August 26 at NASA Langley Research Center to discuss requirements from both agencies

pertaining to the ATD-1 avionics prototype system that will be used for a joint NASA/FAA flight test in 2017.

The TIM was led by William C. Johnson, and attended by managers and technical leaders from FAA headquarters, the FAA Technical Center, NASA Langley, and NASA Ames Research Center. ATD-1 and SAIE Project leadership are reviewing the outcome of the discussions in preparation for an official NASA response that will go to FAA SBS IM leadership. Following the official response to the FAA and resulting discussions, the final requirements will be documented and included for approval by both agencies in the inter-agency ATD-1 Joint Management Plan.

(POC: William C. Johnson)

Raytheon Identifies Near-Term Implementation for T-TSAFE, September 2013

The Terminal Tactical Separation Assured Flight Environment (T-TSAFE) is a tactical conflict detection and resolution tool for terminal airspace. T-TSAFE uses a combination of flight plan, nominal routing, terminal area procedures, dead reckoning and flight intent to improve conflict prediction accuracy and reduce false alerts. Raytheon was tasked by the Federal Aviation Administration to identify the inputs available in the Standard Terminal Automation Replacement System (STARS) that could be used by the T-TSAFE algorithm for a near-term implementation. The company identified flight-intent inputs critical to T-TSAFE performance such as nominal interior routes (routes connecting the arrival route to the runway) that are not available in the current version of STARS. However, these critical flight-intent inputs could be added as static files to the STARS software, making the integration of T-TSAFE in STARS feasible in the near term.

Next steps involve evaluating T-TSAFE performance either with or without the availability of near-term feasible flight-intent information. Further exploration of architecture for the implementation of T-TSAFE in STARS is also planned.

(POCs: Huabin Tang, Savvy Verma, or Shannon Zelinski)

Meeting with Eurocontrol, September 2013

Researchers met with visitors from Eurocontrol on September 16–17 at NASA Ames Research Center, and presented Airspace Systems Program-supported work on the Air Traffic Management Technology Demonstration-1 (ATD-1), the Dynamic Weather Routes System (DWR), Airport Surface Research, the Precision Departure Release Capability (PDRC), and single pilot operations (SPO). The Eurcontrol personnel also provided overviews of their research and development emphases. Discussions were held on sharing of data and investigating future areas for collaboration.

(POC: Kathy Lee)

ATD-1/TSS Technology Transfer, September 2013

On September 30, NASA completed an important technology transfer to the Federal Aviation Administration (FAA) with the delivery of Traffic Management Advisor with Terminal Metering (TMA-TM) and Controller Managed Spacing Tools (CMS) software and documentation. These technologies comprise the FAA Terminal Sequencing and Spacing (TSS) concept, and are designed to improve the utilization of Performance-Based Navigation (PBN) procedures inside congested terminal airspace.

The FAA plans to incorporate TSS in the next deployment of the Time-Based Flow Management (TBFM) tool as part of the Next Generation Air Transportation System (NextGen). TMA-TM precisely schedules arriving aircraft through the terminal airspace all the way to the runway. CMS is a controller tool that provides visual aids on the control screen to maintain aircraft flying the required routes at the proper speed necessary to maintain the TMA-TM generated schedules.

These tools have been extensively tested and refined in simulations at NASA Ames and NASA Langley Research Centers, and with the FAA. The completed transfer products include the concept of operations, benefits assessment, development documents, and many technical publications.
(POC: John Robinson)

// Awards/Papers/Appointments

FAA Excellence in Aviation Research Award Presented, September 2013

The 3D Path Arrival Management (3D-PAM) Project Team, which includes NASA's Efficient Descent Advisor (EDA) work, received the Federal Aviation Administration's (FAA) 2012 Excellence in Aviation Research Award for outstanding research contributions ensuring aviation's continued growth. A ceremony was held at NASA Ames Research Center on September 17, during which Airspace Systems Program Director Dr. John Cavolowsky personally presented the team with certificates on behalf of the FAA.
(POC: Rich Coppenbarger)

National Aeronautics and Space Administration

Headquarters
300 E. Street, SW
Washington, DC 20024
www.aeronautics.nasa.gov

www.nasa.gov